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14. ABSTRACT

The U.S. Navy has focused exceptional resources on documenting its impacts to the marine environment by preparing and completing publicly-releasable Environmental Impact Statements (EIS) for operating areas and training ranges. This documentation relies on information from peer-reviewed scientific research and other available data on sound exposure. Two areas where information gaps currently exist in peer-reviewed literature are environmental characterization and acoustic detection opportunities in known habitats of species sensitive to acoustic disturbance (National Research Council, 2003). The purpose of this study is to start filling the knowledge gaps on these topics by publishing existing model results in a series of refereed papers for reference by the scientific and regulatory communities. The goal is to raise public awareness and improve the technical knowledge base for future marine mammal studies.

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Environmental Characterization and Analysis of Beaked Whale (*Ziphiidae*) Habitats

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LONG-TERM GOALS

The U.S. Navy has focused exceptional resources on documenting its impacts to the marine environment by preparing and completing publicly-releasable Environmental Impact Statements (EIS) for operating areas and training ranges. This documentation relies on information from peer-reviewed scientific research and other available data on sound exposure. Two areas where information gaps currently exist in peer-reviewed literature are environmental characterization and acoustic detection opportunities in known habitats of species sensitive to acoustic disturbance (National Research Council, 2003). The purpose of this study is to start filling the knowledge gaps on these topics by publishing existing model results in a series of refereed papers for reference by the scientific and regulatory communities. The goal is to raise public awareness and improve the technical knowledge base for future marine mammal studies.

OBJECTIVES

Explore the overlap of mid-frequency sound with sighting records of beaked whales to understand the potential habitat sensitivity to noise sources.

Generate a statistical analysis approach of sound propagation in beaked whale habitats.

Demonstrate how the acoustic scene in habitat areas is not uniform as sound propagation interacts with environmental influences, such as steep bathymetry, diurnal changes in sound speed, and bottom loss properties.

Test the hypothesis that attributes of sound production as a function of beaked whale dive depths and vocalization characteristics may be maximized or constrained by the properties of the environment in which they produce their sounds.

APPROACH

Compiled beaked whale sighting, stranding, and capture records (MacLeod and Mitchell, 2006) are referenced to determine the specific habitat characteristics to model. An acoustic-based model (CASS-GRAB) (Keenan et al. 2000) is used to simulate a complex three-dimensional representation of an acoustic environment specific to the depth regime of these deep diving species. The model output is then run through a Matlab analysis to develop a quantitative habitat-oriented approach to determine how the vertical variability of received levels overlaps with dive depths.

WORK COMPLETED

Completed model run output and Matlab analysis scripts for two beaked whale habitat sites (Sagami Gulf, Japan and North Atlantic Frontier, Scotland) (Wezensky et al. 2007a; Wezensky et al. 2007b).

Completed statistical analysis approach of environmental characterization (Wezensky, et al. 2007b).

RESULTS

Leveraging the Naval Undersea Warfare Center internal investment bid and proposal funding, it was demonstrated how the acoustic scene for two locations varies based on seasonal environmental influences and bottom loss properties. By using publicly available databases for model inputs, the analysis results are traceable and reproducible. This approach is key to improving public relations and allows U.S. Navy biologists, conservation managers and the marine mammal scientific community to use the results for experimentation planning and testing.

There still needs to be more effort towards building model inputs that includes target strength data of beaked whale prey, habitat noise levels, and processing recognition differentials in order to fully determine the acoustic detection performance of this species.

IMPACT/APPLICATIONS

It is hoped that this statistical analysis approach and model methodology will help educate interested parties (NGOs, NOAA, Navy environmental planners) on the variability of environmental influences, such as steep bathymetry, diurnal changes in sound speed, and bottom loss properties in beaked whale habitat areas where mid-frequency anthropogenic activities takes place.

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